In the Specification

In the specification, please make the following amendments that are provided by substitution. Marked-up versions of the amendments to the specification follow the remarks section of this response. Replacement paragraphs are provided below and are reference by page and beginning line number.

Please substitute the title with:

CORRECTION OF CORIOLIS FLOWMETER MEASUREMENTS DUE TO MULTIPHASE FLOWS

In the paragraph on page 8, beginning on line 5:

b1

FIG. 3 depicts an undamped dynamic spring assembly 300 that operates on the same physical principles as flowtubes 103A and 103B of Coriolis flowmeter 5 (see FIG. 1) in single phase flow. Spring 302 is connected to an anchor 304 and a mass 306. The mass 306 reciprocates or vibrates on a path parallel to double headed arrow 308. The natural frequency, f_n of assembly 300 is:

T,0230

$$f_n = \frac{1}{2\pi}\sqrt{\frac{K_s}{m}} \qquad (1)$$

where K_s is the spring constant of spring 302 and m is the mass of mass 306. In the case of Coriolis flowmeter 5, m is the combined weight of the flowtubes 103A and 103B together with the mass of material inside the tubes.

B

In the paragraph on page 9, beginning on line 11:

B2

FIG. 4 depicts a damped dynamic spring and mass assembly 400 that operates on the same physical principles as flowtubes 103 A and 103 B of Coriolis flowmeter 5 (see FIG. 1) in multiphase phase flow including gas and liquid. Where possible, like numbering in FIG. 3 has been retained for identical elements in FIG. 4. FIG. 4 differs from FIG. 3 by the addition of a damper 402, which has the effect of reducing the amplitude of vibration along path 308. Equations (1) and (2) still apply to the system shown in FIG. 4, but the overall magnitude of vibration is less due to damper 402.

In the paragraph on page 11, beginning on line 3:

B3

The effects shown in FIGS. 5-6 are similar to the effects of multiphase flow including liquids and solids, e.g., with paraffin, sand, or scale in the fluid, or with scale having actually built up on the internal flowtube walls of flowtubes 103A and 103B. Thus, a system capable of detecting gas and liquid multiphase flow is also capable of detecting, using the same principles, multiphase flow including gas and solids, liquid and solids or scale internal to the flowtubes.

In the paragraph on page 14, beginning on line 7:

As shown in FIG. 8, a schematic block diagram, system 800 includes a manifold 802 having a plurality of electronically actuated wellhead valves 803, 803', and 803" that each provide multiphase flow including gas, liquid and solids to tubing 804. Valves 803, 803' and 803" are preferably three-way electronically-initiated, pneumatically actuated valve, such as the Xomox TUFFLINE 037AX WCB/316 well switching valve with a MATRYX MX200 actuator. Valves 803, 803' and 803" are selectively configured to provide multiphase flow from one well at a time through manifold 802 and tubing 804 to Coriolis flowmeter 806, which may be the same as Coriolis flowmeter 5. Coriolis flowmeter 806 measures the volumetric flow rate of one of the wells connected to valves 803, 803', or 803". The volumetric flow rate of the well helps to determine the contribution of this particular well to total sales. The remainder of material from the other wells connected to valves 803, 803', and 803" flow through to line 808 for passage through second meter 810, which may be a sales meter. Flow through Coriolis flowmeter 806 discharges into meter discharge line 812 and enters water cut meter 812. The flow is thereafter combined with the flow in gathering line 808 for measurement through second meter 810. Exemplary forms of flowmeters 806 and 810 include the ELITE Models CMF300356NU and Model CMF300H551NU, which are available from Micro Motion of Boulder, Colorado.

In the paragraph on page 15, beginning on line 12:

B5

System 800 operates as follows. Manifold 802 carries a material from single valve 803, 803' or 803" to flow through Coriolis flowmeter 806 to test a well or provide mass flow rate information concerning a well connected to the single valve 803, 803', or 803". The material flowing through the remaining valves 803, 803', or 803" flow into gathering line 808 for combined sales output through second meter 810. Coriolis flowmeter 806 provides density and mass flow rate information as meter outputs to transmitter 824 which, in turn, provides signals to controller 818 on lead 822. One of computer 816, controller 818, transmitter 824 or Coriolis flowmeter 806 (typically computer 816) performs a calculation for total volumetric flow rate Q_e according to Equation (4):

T,0260

$$Q_e = \frac{M_e}{D_e} \tag{4}$$

wherein M_e is a Coriolis-based mass flow rate measurement obtained from the total combined oil and water flow stream; and D_e is a density of the total combined oil, gas, water and solids flow stream at a measurement temperature T.

In the paragraph on page 16, beginning on line 7:

B6

The volumetric flow rate values Q_o and Q_w can be corrected to a standard reference temperature, T_{ref}, through multiplication of the volumetric flow rate values by the density at a measurement temperature and dividing by the density at the reference temperature, e.g., as in Equation (7):

T,0261

$$Q_o = Q_{o,T} * \frac{D_{O,T}}{D_O} \tag{7}$$

wherein Q_o is a volumetric oil flow rate at a standard reference temperature T_{ref}; $Q_{o,T}$ is a volumetric oil flow rate measured at temperature T and calculated according to Equation (5); Do is a measured density of oil from laboratory measurements at reference temperature T_{ref}; and $D_{o,T}$ is a density of oil measured at temperature T.

26

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